

period of deformation for erosion to have greatly lessened or almost destroyed whatever unevenness of form the deformation produced.

W. M. D.

A MATHEMATICAL EXHIBIT OF INTEREST TO TEACHERS

FOR the benefit of students and teachers of mathematics who may be visiting Columbia University, the department of mathematics in Teachers College has arranged a permanent exhibit of material available for the study of the history and teaching of the subject. One feature of the exhibit is a collection of mathematical apparatus and models adapted to the needs of the various grades from the kindergarten through the high school, including games, mensuration blocks and models usable in geometry and trigonometry.

In addition to Professor Smith's library of several thousand books and pamphlets upon this subject, there is also available his collection of mathematical instruments—some dating as far back as 1450—of manuscripts, and of engravings and portrait medals of eminent mathematicians.

The early mathematical instruments exhibited include the following: an astrolabe of Arabic workmanship; one of Italian workmanship, signed by the maker, and dated 1509; another, a part dating from about 1450, and the rest, including the four plates, from the following century; and one of Paduan workmanship, signed by the maker, and dated 1557, a practically perfect specimen, with five finely engraved plates. There is also a quadrant of the sixteenth century, one of the primitive instruments of trigonometry, bearing the early names 'Umbra recta,' and 'Umbra versa,' together with several leveling instruments of the seventeenth and eighteenth centuries. There are also numerous measures of length and weight, of the seventeenth and eighteenth centuries, including the ell and some interesting sets of money changers' weights; several finely engraved protractors, diagonal scales, and similar instruments; several sector compasses and compasses of other kinds, of the Renaissance period; a collection of typical forms of dials to illustrate

the application of mathematics to dialling in the Renaissance period, and several armillary spheres of the sixteenth, seventeenth and eighteenth centuries.

The material used to illustrate the development of mechanical calculation includes the following: a collection of medieval counters (jetons, reckoning pennies) of fifteenth and sixteenth century workmanship, partly French and partly German, some with the figure of the Rechenmeister seated at the abacus. Books showing the process of calculation by means of counters 'on the line' are also exhibited. There are also to be seen an Arabic abacus, a Russian tschotü, a Chinese swanpan, a Japanese saroban, a set of Napier's rods, and a set of Korean bones (the modern form of the ancient Chinese 'bamboo rods,' or the Japanese Sangi). Some Japanese books of 1698 are exhibited showing the transition from this latter form of computing to the saroban, which took place in Japan about that time. Besides these there are shown several modern calculating machines, including the Goldman and Stanley arithmometers, slide rules, and similar devices. There are also available for study, in addition to those displayed, several early treatises showing the use of counters, together with numerous works on the historical development of this phase of arithmetic. This is also extensively illustrated in a collection of stereopticon slides belonging to the department.

There are in Professor Smith's library about two thousand portraits of mathematicians. Of these it is possible to exhibit only a relatively small number. About forty are framed and can readily be examined, and visitors wishing to examine others in the collection are assisted in doing so. This part of the collection represents the work of a number of years and the repeated examination of the stocks of many European dealers. It is particularly rich in the works of early engravers, although containing a considerable number of photographs and modern process portraits. Reproductions of a number of the portraits have been made for school and college use by The Open Court Publishing Co., of Chicago.

The collection of Newtons includes all

the most important portraits of this great mathematician and physicist. An effort has also been made to acquire all the best portraits of Leibnitz, Descartes, Euler, the Bernoullis, Legendre, Monge, Cauchy and others who stand out as particularly prominent in the creation of pure mathematics. The collection also includes the portraits of many who have achieved success in the field of applied mathematics, notably of men like Laplace, Lagrange, Huyghens, Bailly and Arago.

Many of these portraits have been reproduced in stereopticon slides for the use of the department, and copies are supplied to schools at cost.

The collection of medals of mathematicians includes more than a hundred pieces. The following are among the most prominent mathematicians represented: Fr. Arago, Archimedes, Aristotle, Bailly, Bertrand, Bonnet, Tycho Brahe, Cardan, Cassini, Cauchy, Cavalieri, Copernicus, d'Alembert, De Moivre, Descartes, Euler, Fermat, Galileo, Gassendi, Gauss, Grandi, Halley Hutton, Huygens, Kepler, Lacroix, Lagrange, Lalande, Laplace, LeVerrier, Lobachevsky, Maurolicus, Monge, Neudorffer, Newton (seven medals), Pascal, Pestalozzi, Poinset, Poisson, Pythagoras, Quetelet, Stevin, Thales, Viviani, Wolf, Wren.

The complete set of mathematical portrait medallions by David d'Angers is included. In addition to the portraits there are numerous other medals of interest in the history of mathematics, including the rare Metric System piece of 1872.

Another interesting feature of the exhibit is Professor Smith's collection of autographs of mathematicians. On account of space, it is possible to exhibit only a few of the several thousand autographs in the library. The following are among the most interesting, and are shown in one of the wall cases: Newton—a two-page manuscript demonstration written for one of his students at Cambridge; Leibnitz—an autograph letter relating to a series of integrals; autograph letters of Sir William Rowan Hamilton, Euler, Johann Bernoulli, Mersenne (written about 1625), Maupertuis,

Legendre, Wronski and Arago; documents signed by Gauss, Laplace, and Lagrange; autograph letters from Poncelet to Liouville, Liouville to Dirichlet, and Arago to Poncelet. Autograph letters of the following mathematicians have been taken from the files so as to be accessible, and are usually displayed: in pure mathematics—Jacobi, Cayley, Sylvester, Kronecker, Cremona, Hachette, Poincaré, Hermite, Clebsch, Cauchy, Chasles, Clifford, Binet, Bezout, Monge; in astronomy—Bode, Airy, Delambre, the three Cassinis, Maskeleyne, Flamsteed, Flammarion; in physics—Ohm, Bessel; in the history of mathematics—Monteula, Fuss, Libri, Kästner, P. Tannery, M. Cantor.

In the line of Newtoniana there are five framed portraits of Newton, as follows: Mezzotint by Simon, after Thornhill; line engraving by George Vertue, after Vanderbank; line engraving by Houbraken, after Sir G. Kneller; lithograph by G. B. Black, after Wm. Gandy; line engraving by E. Scriven, after Vanderbank. There are seven medals of Newton, representing the work of Croker (bronze and silver), Dassier, Roëttiers, and Petit (two specimens), besides one without the artist's name. The Newton manuscript was long in the library of Professor Jacoli, at Venice. It consists of a physical demonstration written by Newton at Cambridge, for an Italian student, c. 1700. The impression of Newton's Galileo seal is from the original which was recently presented to the South Kensington Museum. The bust of Newton is after the original by Roubillac. The unframed portraits, numbering over one hundred, include specimens of the work of the following engravers: Phillibrown, Zeelander, Lips, Romney, Fry, Rivers, Scott, Tardieu, Ridley, Goldar, Cars, Laderer, Le Cœur, Freeman, Seeman, Krauss, Ravenet, Guadagnini, Holl, McGahey, Conquy, Zuliani, Cooke, Le Keux, Normand, Landon, Baumann, Wedgwood, Dupin, Smith, Edwards, Desrochers, Weber and others.

There are also displayed a number of books and curios illustrating certain steps in the history or the teaching of mathematics. These include a Babylonian cylinder with

cuneiform numerals, a piece of ancient Egyptian pottery with the zodiacal signs, Roman coins illustrating certain unusual forms in the ancient numeral system, some English tally sticks of 1296, two Renaissance comptus medals, and a celestial sphere of the sixteenth century.

The bibliographical curios include one of the few copies saved from the fire which destroyed most of the first edition of Libri's 'Histoire des Mathématiques' (Vol. I.), with Libri's autograph marginal notes. There are also autograph presentation copies of Laplace's 'Théorie des Probabilités' and of Halliwell's 'Rara Mathematica,' over a hundred unpublished autograph letters of Prince Boncompagni on the history of mathematics, numerous first or early editions of works by such writers as Newton, Descartes, Tartaglia, Cardan, Bombelli, Paciucolo, Euler and Barrow, a number of the earliest editions of Euclid, an unpublished French translation of Cantor's 'Mathematische Beiträge zum Kulturleben der Völker,' from the library of Chasles, and various similar works of bibliographical interest.

THE COMMITTEE OF ONE HUNDRED

At the meeting of Section I of the American Association for the Advancement of Science held in New York on December 29, 1906, Professor Irving Fisher, of Yale University, reported for the 'Committee of One Hundred' of which he is chairman. This committee was appointed in accordance with a vote of Section I at its meeting last July, in Ithaca, its purpose being to consider the best methods of securing the establishment of a national department or bureau of health. This vote was taken in consequence of a paper on this subject read at the Ithaca meeting by Professor J. P. Norton. There had been previous attempts to secure a national department of health, notably those of the American Medical Association, which for twenty years has reported favorably on the subject, but has been unable to secure a large interest in the project, outside of the medical profession. The present movement is not a medical movement, although the medical profession is fully

represented in it. The movement was endorsed on December 13 by the joint conference at Washington of the legislative committee of the American Medical Association and the National Council on Medical Legislation before which the first draft of a bill was read prepared by Representative Barchfeld to establish a national department of health. The following is the list of the committee of one hundred as at present constituted:

COMMITTEE OF ONE HUNDRED OF SECTION I. OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, APPOINTED TO CONSIDER METHODS OF ESTABLISHING A NATIONAL DEPARTMENT OF HEALTH

Appointed from the A. A. A. S.

Dr. Wm. H. Welch, pres. A. A. A. S. and of State Bd. of Health of Maryland; professor of pathology, Johns Hopkins University.

L. O. Howard, secretary of the A. A. A. S.; chief bureau of entomology, U. S. Dept. of Agric.

Professor Irving Fisher, chairman of the committee of 100, and of the Economic Section of A. A. A. S.; prof. of political economy, Yale University.

J. Franklin Crowell, Sec. of Economic Section of A. A. A. S.; Editor of *Wall Street Journal*.

Professor J. P. Norton, author of paper on national health department read before the American Association for the Advancement of Science, on the basis of which the committee was appointed; prof. of political economy, Yale University.

Professor James McKeen Cattell, editor, *SCIENCE*, the official organ of the A. A. A. S.; prof. of psychology, Columbia University.

Appointed from the United States Government.

Dr. Robert M. O'Reilly, surgeon general, U. S. Army.

Dr. P. M. Rixey, surgeon general, U. S. Navy.

Col. William C. Gorgas, sanitary officer, Isthmian Canal.

H. W. Wiley, chief, bureau of chemistry, Dept. of Agric.

Dr. Cressy L. Wilbur, chief statistician, Vital Statistics, U. S. Census.

A. C. True, director, office of experiment stations, Dept. of Agric.

Chas. P. Neill, commissioner of labor, Dept. Commerce and Labor.

James R. Garfield, chief bureau of corporations, Dept. Commerce and Labor.